1st. That a tendon, having been divided, may reunite without leaving permanently a cicatrix.

2ndly. That the uniting new material may be drawn out to any required length, and in such case may, under gradual and carefully regulated extension, even acquire the thickness of the tendon itself; but that if the divided ends are widely separated after the section, and so remain, reunion will not take place.

3rdly. That the addition of new tendon does not impair the strength of the muscle, unless the length be more than sufficient, in which case it occasionally weakens the muscle.

The process of reunion is explained, and the appearances presented by the tendon in the various stages of reunion are detailed and illustrated by coloured drawings. Preparations of the parts operated on were also exhibited. The author concludes that, when the divided ends of the tendon are held in apposition and the limb is kept at rest, reunion will take place without leaving a cicatrix; but that when extension is made, the new material becomes organized, and persists as a permanent structure.

III. "On the Curvature of the Indian Arc." By the Venerable JOHN H. PRATT, M.A., Archdeacon of Calcutta. Communicated by Professor STOKES, Sec. R.S. Received November 8, 1859.

(Abstract.)

In a paper published in the Philosophical Transactions for 1855, in which the author calculates the effect which the attraction of the mountain mass north of India has upon the plumb-line at stations in the plains on the south, he applied the deflections as corrections to the astronomical amplitudes, to ascertain what influence they would have upon the determination of the curvature of the Indian Arc of Meridian. The method he adopted was to compare together the two measured arcs between Kaliana and Kalianpur, and between Kalianpur and Damargida. The calculation brought out an ellipse of which the ellipticity is $\frac{1}{426}$. Colonel Everest had deduced by a comparison of the same arcs, but with uncorrected amplitudes, an

ellipticity $\frac{1}{191\cdot6}$. These two values are on opposite sides of the mean ellipticity for the whole earth, from which they differ by about $\frac{2}{7}$ths and $\frac{4}{7}$ths of the mean.

In these calculations the ellipses are found which *exactly* accord with the measured lengths and the corrected latitudes in the one case, and in the other the latitudes uncorrected for deflection. A more correct method has been followed by Captain A. Clarke, R.E., in the volume of the Ordnance Survey just published by Lieut. Colonel James, R.E. Captain Clarke takes the latitudes of the three stations mentioned above, as corrected for mountain attraction by Archdeacon Pratt, and supposing the corrected latitudes as well as the elements of the mean ellipse subject to error, he determines, according to the method of least squares, the ellipse which best corresponds with the mean ellipse and with the three corrected latitudes. The resulting ellipse depends of course upon the height attributed to the mean ellipse, which is left arbitrary, to be assigned at the end of the calculation. In this way Captain Clarke shows that it is possible to obtain an ellipse which differs much less from the mean ellipse, and yet which makes the differences between the three latitudes calculated from the ellipse and the observed latitudes corrected for deflection, very small.

Since this calculation was made by Captain Clarke, the author communicated to the Royal Society an approximate estimate of the effect of the deficiency of matter in the ocean south of Hindostan, on the plumb-line. On seeing Captain Clarke's result, he felt anxious to ascertain what effect this new disturbing cause would have upon it. The present paper contains a repetition of the calculations of Captain Clarke, with the additional corrections to the latitudes due to the defect of attraction of the ocean introduced into them. Capt. Clarke's result, the author finds, is thereby improved, the ellipse obtained coming out somewhat nearer to the mean ellipse, while the errors in the latitudes, which already were very small, are still further reduced. The following are the values of the semi-axes a b (in feet) and of the reciprocal of the ellipticity corresponding,—I. to the mean ellipse, as determined by Captain Clarke; II. to the first of the two ellipses (corresponding to two different degrees of importance assigned to the mean ellipse) obtained by Captain Clarke by combining the mean ellipse with the Indian Arc; III. to the ellipse II. recalculated by

the author, with the additional correction for ocean attraction introduced.

	a.	*b*.	$b:a-b$.
I. . . .	20926500	20855400	294
II. . . .	20920328	20846522	283·7
III. . . .	20919988	20846981	286·55

The residual errors of latitude at Damargida, Kaliana, and Kalianpur, which in Captain Clarke's ellipse were $+1''{\cdot}05$, $-0''{\cdot}95$, $+1''{\cdot}20$, are now reduced to $+0''{\cdot}93$, $-0''{\cdot}37$, $+0''{\cdot}74$.

In conclusion, the author calculates the distance of a point in the latitude of Kaliana from the centre of the earth in the three ellipses, and finds it to be near 7000 feet greater in the ellipses II. and III. than in the mean ellipse I. That deviations to such an extent as this from the mean ellipse should actually occur he thinks likely enough, and he is not disposed to have recourse to some yet undiscovered cause to reconcile the Indian Arc with the mean ellipse. The occurrence of marine fossils in mountains and elevated regions, shows that great changes of level of the land relatively to the water have actually taken place; and it seems unlikely that an extensive internal change in the state of the earth would cause an upheaval or depression of the land or the water alone; it might rather be expected that both would be affected, though unequally. Hence the absolute change of distance of the land from the centre of the earth may have been much greater than the elevation relatively to the water, while the phenomena adduced indicate that even the latter must have been very great.

IV. "Comparison of some recently determined Refractive Indices with Theory." By the Rev. Baden Powell, M.A., F.R.S., F.G.S., F.R.A.S., Savilian Professor of Geometry in the University of Oxford. Received November 17, 1859.

In a series of papers inserted in the Philosophical Transactions (1835, 1836, 1837), and afterwards, in a more correct and complete form, in my Treatise 'On the Undulatory Theory applied to the Dispersion of Light' (1841), I endeavoured to investigate the great problem of the explanation of the unequal refrangibility of light on